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Evaluation of the Waste Reduction Program in Cihaurgeulis Subdistrict, Bandung City, Indonesia

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ABSTRACT: Waste reduction at the subdistrict level was assessed not only based on the availability of facilities but also on source separation, household participation, and the amount of waste actually diverted. This study evaluated the waste reduction program in Cihaurgeulis Subdistrict, Bandung City, which was implemented with assistance from YPBB. The study used secondary data from June 2025 and documentation of the existing waste management system. The analysis was conducted descriptively and quantitatively by examining household sorting rates, waste generation, waste composition, and waste reduction, while the program's achievement was benchmarked against the 30% national reduction target and findings from previous community-based studies. The results showed that 980 of 2,323 households (42.19%) had sorted their waste. Total waste generation reached 92,814.93 kg/month, with residual waste representing the largest fraction at 46,374.11 kg/month (49.96%). The amount of waste reduced was 46,440.82 kg/month, equivalent to approximately 50.04% of the total waste generated, consisting of 35.73% organic waste and 14.31% inorganic waste. Within the organic waste stream, only 10.93% of the total waste generated was treated within the area, whereas 24.80% depended on city-scale treatment. Although this achievement exceeded the 30% reduction target, the program still required improvement because residual waste remained high, sorting performance varied among neighborhood units, and local organic waste treatment capacity was limited. Program improvements should focus on repeated household education accompanied by monitoring, stronger field coordination, standardized waste-bank recordkeeping, and increased organic waste treatment capacity near the source.

KEYWORDS: Waste reduction; source separation; organic waste; residual waste; Cihaurgeulis

1. Introduction

Municipal waste remained a significant challenge for many cities in Indonesia, including Bandung City. Global municipal waste generation was projected to continue increasing toward 3.4 billion tonnes by 2050, with cities in developing countries carrying a substantial share of this burden because collection coverage, treatment capacity, and public participation often lagged behind waste generation [1,2]. Household waste could not simply be viewed as the residual material of daily activities because, from the point of generation, some materials could still be utilized, while others ultimately became residual waste. The basic framework for household waste management in Indonesia was established through Law Number 18 of 2008, which identified waste reduction and handling as the two main pillars of municipal waste management [3].

The 3R approach (Reduce, Reuse, Recycle) was important because it diverted part of the waste stream from being transported directly to transfer stations (TPS) or final disposal sites (TPA). Although the principle was relatively simple, its implementation was not always straightforward because it depended heavily on household waste-sorting practices. Previous evidence showed that residents separated waste consistently when appropriate infrastructure was conveniently available and sorting behavior was continuously supervised and reinforced [4]. Studies conducted in Indonesian cities also showed that community participation and consistent assistance, including support from environmental cadres, training programs, and access to waste banks, influenced the success of waste reduction programs more strongly than socio-economic characteristics [5].

Bandung City faced considerable pressure in managing municipal waste; therefore, waste reduction programs at the local level needed to be evaluated in greater detail. Under national policy, the reduction of household waste and household-like waste was targeted to reach 30% by 2025 [6]. The urgency of waste reduction increased following the overcapacity problem and fire at the Sarimukti regional landfill in 2023, which disrupted waste transportation for several weeks and prompted the city to prioritize organic waste diversion at the neighborhood level [7]. Although the 30% reduction target provided an important benchmark, its achievement needed to be interpreted together with actual field conditions, particularly household sorting rates, treatment capacity, and the amount of residual waste remaining after reduction activities.

Cihaurgeulis Subdistrict was selected as the evaluation site because an area-based waste management program had been implemented with assistance from YPBB. The area comprised 12 neighborhood units (RW) that actively participated in the waste collection and reduction system. In June 2025, the population of Cihaurgeulis Subdistrict was recorded at 11,089 people, comprising 3,720 families and 2,323 houses. Geographically, the subdistrict was located in Cibeunying Kaler District, Bandung City, and covered an area of approximately 0.75 km² [8]. Previous evaluations of community-based waste management in Indonesia mostly reported participation surveys or aggregate statistics, including studies of waste banks in Surabaya, Malang, and Makassar [9–11]. Quantified mass-balance evaluations at the level of individual RWs, benchmarked directly against the national waste reduction target, remained limited. This study addressed this gap. The objectives of the study were to quantify the monthly amounts of organic, inorganic, and residual waste in each RW; determine the household sorting rate and total waste reduction; evaluate the program's achievement against the 30% national reduction target; and formulate improvement priorities for the waste management program and its facilitating organization.

2. Materials and Methods

2.1. Research Design and Data Collection.

This study used a descriptive quantitative approach. The main data analyzed were secondary waste management data from Cihaurgeulis Subdistrict for June 2025, including population, number of houses, number of households practicing waste sorting, waste generation, waste composition, organic waste treated within the area, organic waste treated by the Environmental Agency (DLH), recyclable inorganic waste, and residual waste. Monthly waste-stream masses for each RW were recorded by YPBB field teams, while area data and the technical waste management plan were used to characterize the study area and existing management conditions [12]. Primary observations and photographic documentation were used only to describe existing sorting, containerization, and collection practices and were not used for quantitative analysis. The study was conducted in Cihaurgeulis Subdistrict, Cibeunying Kaler District, Bandung City. The geographical location of the study area is presented in Figure 1.

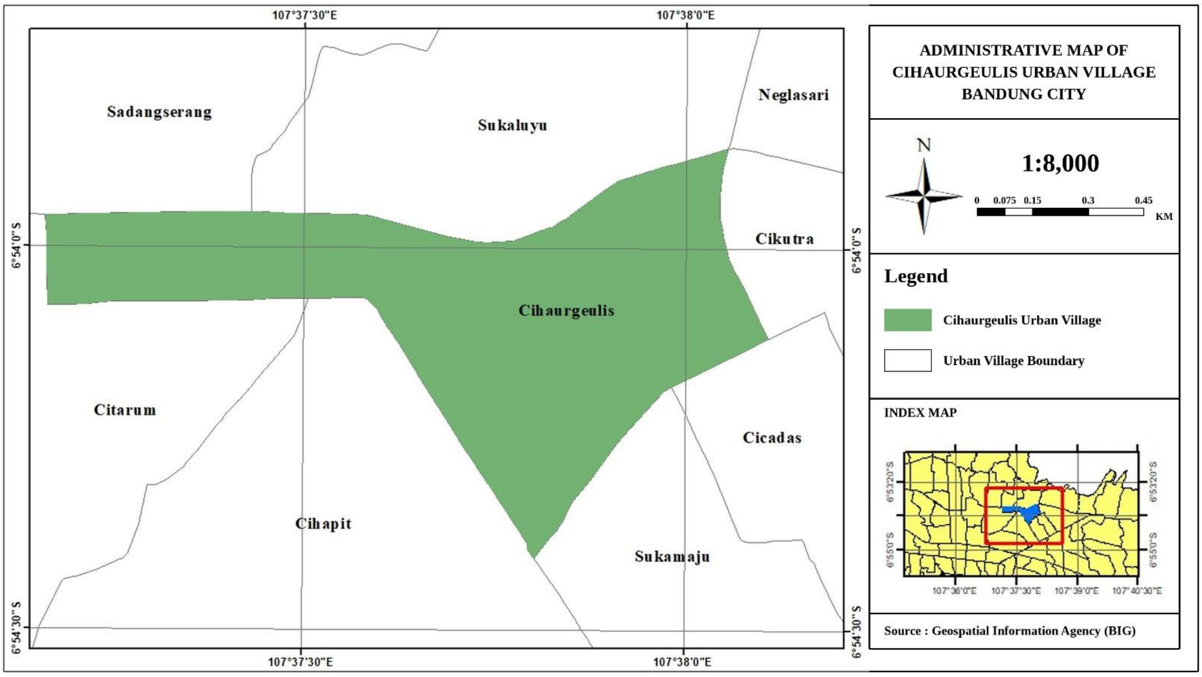

Figure 1. Research Location.

The data sources, data types, and corresponding analytical methods used in this study are summarized in Table 1. Waste generation, composition, and reduction were analyzed using quantitative secondary data, whereas observations and documentation were used to describe the operational waste management system. The national policy target was used as the benchmark for evaluating waste reduction performance.

Table 1. Data and Analysis Methods.

Data	Data Source	Data Type	Analysis
Waste generation	DLH/RTPS and population data	Quantitative secondary	Calculation of kg/day and kg/month
Waste composition	Subdistrict waste management data	Quantitative secondary	Percentage of organic, inorganic, and residual waste
Waste reduction	YPBB and RW management data	Quantitative secondary	Reduction percentage relative to total waste generation
Operational system	Observation and documentation	Qualitative primary	Description of sorting, containerization, and collection
Policy target	Presidential Regulation No. 97 of 2017	Regulatory document	Comparison of achievement with the 30% reduction target

2.2. Data Analysis and Waste Reduction Calculation.

The analysis was conducted in four sequential stages: data collection, validation and tabulation for each RW, calculation, and evaluation. First, the household sorting rate was calculated by comparing the number of households practicing waste sorting with the total number of houses in each RW. Second, waste generation was calculated based on the population and a waste generation rate of 0.27 kg/person/day. Third, waste composition was classified into four categories: organic waste treated by DLH, organic waste treated within the area, recyclable inorganic waste, and residual waste. Fourth, the waste reduction achievement was calculated using the following equation:

Waste reduction (%) = [(treated organic waste + recovered inorganic waste) / total waste generation] × 100

The calculated reduction percentage was subsequently compared with the national waste reduction target of 30%, as indicated in the policy-target component of Table 1. The overall analytical procedure followed the technical-operational logic of solid waste management evaluation by examining the relationship among waste generation, source separation, collection, treatment, recovery, and final disposal [13].

2.3. Data Standardization and Reporting.

All waste composition and reduction data were standardized to kg/month because the reported values represented monthly accumulations. The unit kg/day was used only to estimate average daily waste generation. This standardization was necessary to avoid ambiguity because daily and monthly data served different analytical purposes in evaluating waste generation, composition, and reduction performance [14]. For consistency, all waste mass values were reported to two decimal places, and percentages were expressed to two decimal places throughout the study. This standardized reporting approach was applied to the RW-level analysis and subsequent comparison of waste reduction performance with the national target.

3. Results and Discussion

3.1. Area-Based Waste Management System.

The waste management system in Cihaurgeulis Subdistrict was designed to reduce waste starting at the household level. As illustrated in Figure 2, the management flow began with waste sorting and containerization at the source, followed by separate collection by field workers. Organic waste was directed either to local treatment facilities or to treatment managed by the Environmental Agency (DLH). Recyclable inorganic waste was diverted through recovery and reuse mechanisms, whereas residual waste was transported to the transfer station. This management approach was consistent with technical-operational procedures for municipal solid waste management, which emphasized source separation, collection, recovery, treatment, and final disposal [15]. Conceptually, the existing system followed the 3R (Reduce, Reuse, Recycle) principle because recyclable and treatable materials were diverted before the remaining waste reached the transfer station. However, the effectiveness of the system depended strongly on two interconnected factors: consistent household sorting and sufficient local treatment capacity. When source separation was inconsistent, potentially recoverable materials could enter the residual waste stream. Similarly, limited local organic waste treatment capacity increased dependence on external treatment by DLH. Previous reviews of community-based waste management in developing countries reported similar challenges, particularly when treatment capacity, recordkeeping, institutional support, and community participation did not develop simultaneously [16]. Therefore, the existence of a waste management system alone did not necessarily guarantee effective waste reduction; its performance depended on consistent implementation throughout the entire management chain.

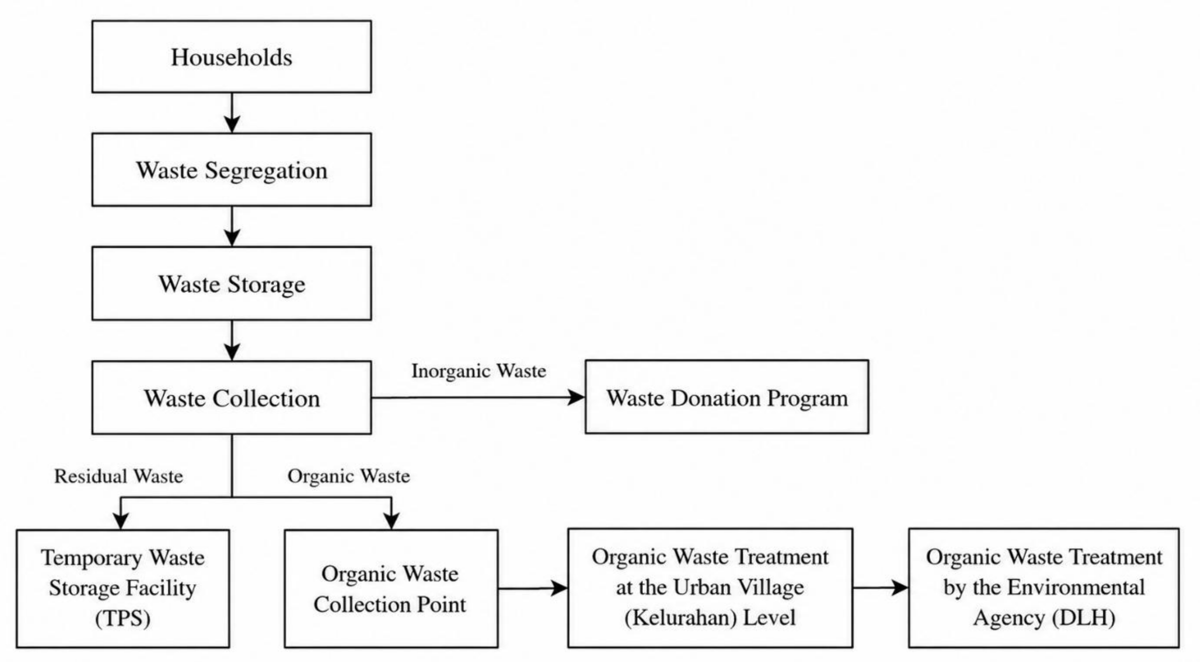

Figure 2. Waste Management System Flow in Cihaurgeulis Subdistrict.

3.2. Household Waste Sorting Rate.

Household waste sorting represented an important initial indicator of the effectiveness of the waste reduction program. As presented in Table 2, 980 of the 2,323 registered houses practiced waste sorting, resulting in an overall sorting rate of 42.19%. Considerable variation was observed among the 12 RWs. RW 7 recorded the highest sorting rate at 65.67%, closely followed by RW 10 at 65.00%, whereas RW 5 recorded the lowest rate at 29.93%. RW 11 also showed relatively high participation at 50.35%, while the remaining RWs generally recorded sorting rates between approximately 35% and 45%.

Table 2. Household Waste Sorting Rate per RW.

RW	Population (people)	Number of Houses	Sorting Houses	Sorting Rate
1	706	158	55	34.81%
3	572	94	38	40.43%
4	958	184	74	40.22%
5	1,110	274	82	29.93%
6	2,113	362	127	35.08%
7	360	67	44	65.67%
8	1,160	252	101	40.08%
9	1,322	257	103	40.08%
10	745	220	143	65.00%
11	607	143	72	50.35%
12	450	115	52	45.22%
14	986	197	89	45.18%
Total	11,089	2,323	980	42.19%

The results in Table 2 indicated that the waste sorting program had been implemented across all RWs, although household participation remained uneven. An overall sorting rate of 42.19% meant that fewer than half of the registered households consistently participated in source separation. Therefore, although the program had established a functional basis for household sorting, source separation had not yet become a routine practice for the majority of households. This finding was consistent with previous behavioral studies showing that waste separation became more stable when appropriate infrastructure, social norms, repeated education, and routine reinforcement were established [5, 17, 18].

The substantial differences among RWs also suggested that participation was influenced by more than the availability of technical instructions. RW 7, which achieved the highest sorting rate, had access to a composting chamber and a waste bank, whereas RW 10 benefited from road access wider than three meters, which facilitated motorized waste collection. These conditions suggested that convenient access to waste management facilities, collection accessibility, continuous education, interaction between field workers and residents, and support from RW administrators contributed to sustained household participation. Previous studies similarly identified distance from waste facilities as a factor negatively affecting appropriate waste disposal behavior [19], whereas awareness, repeated education, and demonstration activities were associated with increased participation [4, 20, 21]. Consequently, the overall sorting rate of 42.19% represented meaningful participation but also demonstrated considerable potential for further improvement.

Compared with previous community-based waste management studies, the 42.19% sorting rate in Cihaurgeulis was higher than participation levels reported during the early stages of several Indonesian community-based programs, in which active household participation was generally below one third [5, 9]. However, the results also demonstrated that sorting had not yet become a universal household practice. Similar discrepancies between willingness and actual participation have been reported in other cities in the Global South, where residents expressed support for waste management programs but often perceived waste separation as primarily the responsibility of waste collectors [22].

The comparison with previous studies is summarized in Table 3. Unlike studies that primarily examined participation factors, waste-bank material flows, or institutional integration, the present study combined household participation with an RW-level waste mass balance. This approach allowed the sorting rate to be interpreted together with the quantity of waste actually diverted from the residual stream. As shown in Table 5, the program achieved a sorting rate of 42.19% and an overall waste reduction rate of 50.04%, indicating that the effectiveness of the program could not be evaluated solely from household participation but also needed to consider the actual quantity of waste recovered or treated.

Table 3. Comparison with Previous Community-Based Waste Studies.

Location	Approach	Key Finding	Ref.
Bandung	Per-RW mass balance, NGO-assisted program	42.19% sorting; 50.04% reduction, exceeding the 30% target	This Study
Surabaya	Household survey on participation factors	Supporting factors outweighed socio-economic characteristics	[5]
Malang	Waste-bank material-flow estimation	Recyclable material flows and revenue supported community recycling	[10]
Makassar	Waste bank–municipal policy integration	Integration with municipal policy improved program continuity	[11]
Kampala	Urban community survey	High willingness but low actual participation without adequate program support	[22]

3.3. Waste Generation and Composition.

Based on a population of 11,089 people and a waste generation rate of 0.27 kg/person/day, the average waste generation in Cihaurgeulis Subdistrict was estimated at 2,994.03 kg/day. When accumulated over one month, the total waste generation reached 92,814.93 kg/month. This value represented an estimate based on population data and the adopted per-capita generation rate and therefore provided an indication of the overall waste burden during the evaluation period [8,12]. The generation rate of 0.27 kg/person/day was lower than the 0.33 kg/person/day reported for households in Surabaya [5] and the 0.44–0.49 kg/person/day reported for secondary towns in Ethiopia [21]. This relatively low generation rate may have reflected the predominantly residential characteristics of the study area and the limited contribution of large commercial waste generators. The detailed waste composition for June 2025 is presented in Table 3. Residual waste represented the largest component, reaching 46,374.11 kg/month or 49.96% of the total waste generated. Organic waste accounted for a combined 33,159.00 kg/month (35.73%), of which 23,017.00 kg/month (24.80%) was treated through DLH and 10,142.00 kg/month (10.93%) was treated within the area. Recyclable inorganic waste accounted for the remaining 13,281.82 kg/month, equivalent to 14.31% of total generation.

Table 3. Waste Composition of Cihaurgeulis Subdistrict in June 2025.

Waste Composition	Weight (kg/month)	Percentage
Organic treated by DLH	23,017.00	24.80%
Organic treated within the area	10,142.00	10.93%
Recyclable inorganic	13,281.82	14.31%
Residue	46,374.11	49.96%
Total	**92,814.93**	**100.00%**

The results in Table 3 indicated that almost half of the total waste generated remained in the residual stream. However, this proportion did not necessarily represent materials that were inherently non-recoverable. Unsorted household waste was classified within the residual stream; therefore, some organic and recyclable materials that could potentially have been diverted may have remained mixed with the residue. Consequently, the 49.96% residual fraction could be interpreted as an indication of both material characteristics and incomplete source separation. Improved household sorting could therefore reduce the residual fraction while increasing the amount of organic and recyclable waste available for recovery. The proportional distribution of the four waste streams is illustrated separately in Figure 3. The figure clearly showed the dominance of residual waste, followed by organic waste treated through DLH, recyclable inorganic waste, and organic waste treated within the area. This distribution also demonstrated that although 35.73% of the total waste stream consisted of separately managed organic waste, most of this fraction depended on external treatment by DLH. Only 10.93% of total waste generation was treated organically within Cihaurgeulis itself, indicating limited local treatment capacity.

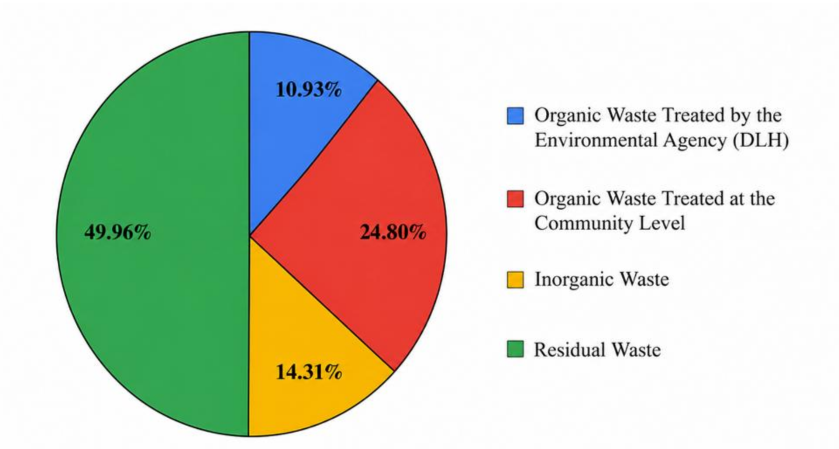

Figure 3. Waste Composition Percentage of Cihaurgeulis Subdistrict.

The organic waste proportion of 35.73% was lower than the approximately 40–65% commonly reported for residential waste in low- and middle-income settings [1,23]. One possible explanation was that a portion of the organic waste remained mixed within the residual stream because household source separation had not yet been fully established. This interpretation was consistent with the household sorting rate reported in the previous section. Thus, the composition results highlighted two interconnected priorities: increasing household participation in source separation and expanding local organic waste treatment capacity. Improvements in both aspects could reduce dependence on DLH treatment and decrease the amount of residual waste requiring further transportation and final disposal.

3.4. Waste Reduction Achievement.

Total waste reduction was calculated based on the amount of treated organic waste and recovered inorganic waste. In June 2025, the total amount of waste reduced reached 46,440.82 kg/month, equivalent to approximately 50.04% of the total waste generated. Numerically, this achievement exceeded the national waste reduction target of 30% for 2025 [6]. However, the result needed to be interpreted carefully because 49.96% of the total waste generated remained in the residual stream. Therefore, exceeding the national target did not necessarily indicate that the waste management system had achieved optimal performance. The mass balance of the waste management system is presented in Figure 4. Organic waste management contributed the largest proportion of waste reduction, accounting for 35.73% of total waste generation, while recyclable inorganic waste contributed 14.31%. This finding was reasonable because organic waste generally represented a major recoverable fraction of residential municipal waste. Nevertheless, the distribution of organic waste treatment revealed an important limitation in the existing system.

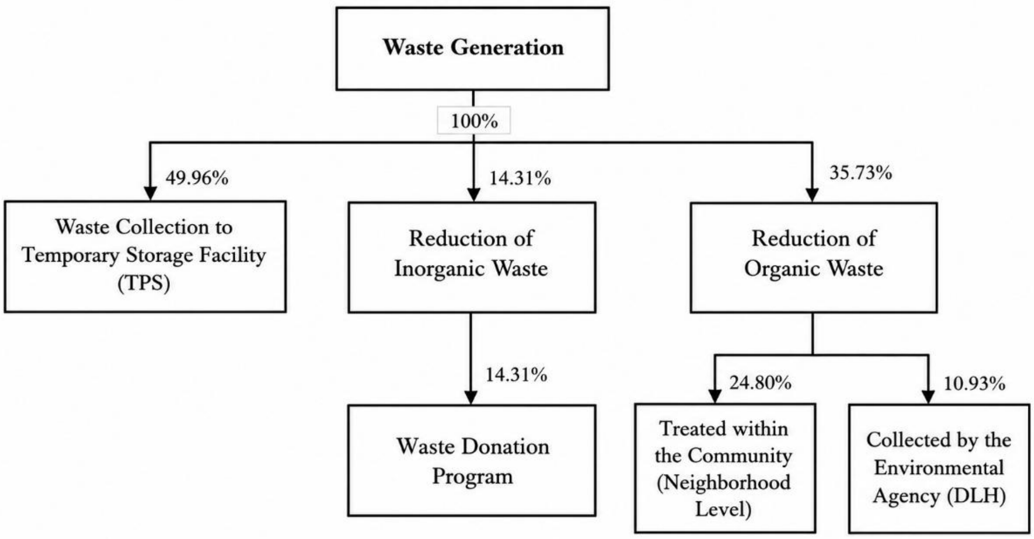

Figure 4. Mass Balance of Waste Management in Cihaurgeulis Subdistrict.

Of the total waste generated, only 10.93% was treated within the study area, whereas 24.80% was treated through DLH. This indicated that approximately two-thirds of the separately managed organic waste depended on city-scale treatment rather than local treatment facilities. The relatively low contribution of in-area treatment was associated with the limited number and capacity of organic waste treatment facilities available across the RWs. This dependence represented a potential structural vulnerability because disruptions to city-scale transportation or treatment services could substantially reduce overall waste diversion. Based on the existing data, if the organic waste treated through DLH was excluded, the locally managed reduction would consist of 10.93% organic waste and 14.31% recyclable inorganic waste, resulting in an autonomous reduction rate of approximately 25.24%. This value would have remained below the national target of 30%. The vulnerability of such dependence became particularly relevant considering the waste management disruptions experienced during the Sarimukti landfill emergency [7].

The inorganic waste reduction rate of 14.31% indicated that recycling, reuse channels, and waste banks had already contributed to waste diversion. However, further improvement remained possible through increased household participation, better accessibility to waste banks, and more systematic management of recyclable materials. Previous studies in Indonesia showed that waste banks were more likely to sustain community participation when facilities were accessible, economic incentives were attractive, and administrative and financial records were managed consistently [9,10,24]. Thus, strengthening both organic treatment and recyclable material recovery was important for improving the resilience of the overall reduction system. Waste reduction performance also varied considerably among RWs, as presented in Figure 5. The highest reduction percentages were recorded in RW 12 at 82% and RW 7 at 81%, whereas the lowest were recorded in RW 6 at 34% and RW 9 at 36%. These differences demonstrated that the overall subdistrict reduction rate of 50.04% masked substantial spatial variation in waste management performance among individual RWs.

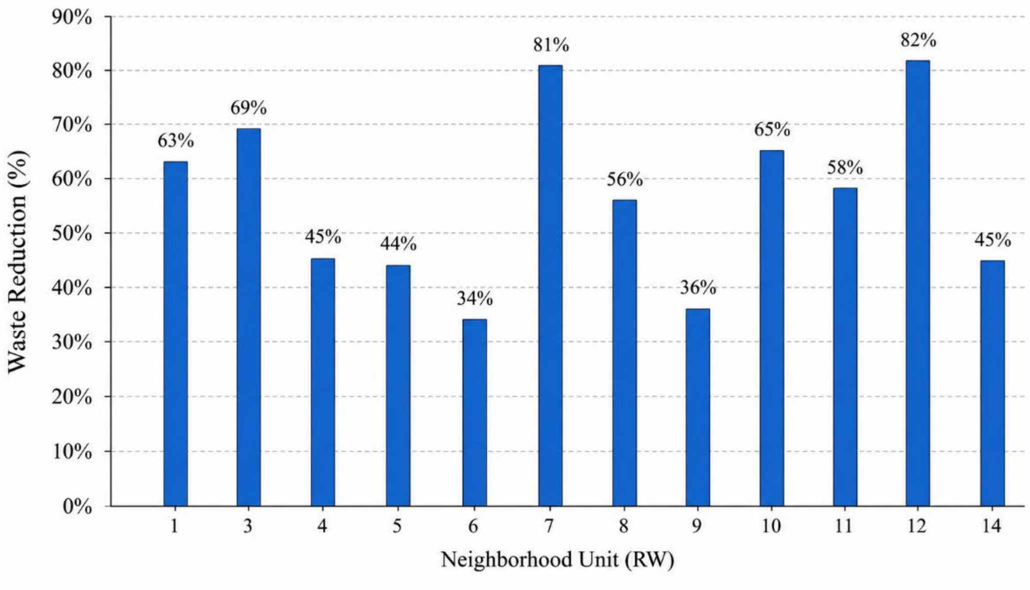

Figure 5. Waste Reduction Percentage per RW.

The lower reduction performance observed in several highly populated RWs suggested that population size and the corresponding waste load may have placed additional pressure on existing collection and treatment capacity. However, the relationship should not be attributed solely to population size without statistical confirmation. Differences among RWs may also have been influenced by housing density, household sorting behavior, accessibility of treatment and collection facilities, involvement of local administrators, frequency of waste collection, and access to waste banks. Previous community-based studies similarly showed that waste management performance was influenced by interactions among demographic characteristics, infrastructure availability, local institutional support, accessibility, and community participation [5, 19, 25]. Therefore, the variation among RWs indicated the need for locally targeted interventions rather than applying identical improvement strategies across the entire subdistrict.

From a treatment perspective, the existing combination of aerated brick composting chambers (bata terawang) and a small-scale biodigester was technically suitable for decentralized organic waste management. Composting was appropriate for garden waste and other compostable organic materials, whereas anaerobic digestion was particularly applicable to wet food waste and offered the additional benefit of biogas production [26]. Decentralized composting was also reported to reduce greenhouse gas emissions compared with landfilling under comparable tropical conditions [27]. The primary limitation in Cihaurgeulis therefore appeared to be the limited availability and capacity of local treatment units rather than the fundamental suitability of the technologies themselves. Expanding decentralized organic treatment facilities across additional RWs could increase the proportion of waste managed near its source, reduce transportation requirements, decrease dependence on city-scale treatment facilities, and improve the resilience of the waste reduction system during external disruptions [7]. Such expansion should be accompanied by improved source separation and operational monitoring to ensure that additional treatment capacity resulted in measurable reductions in residual waste.

3.5. Program Problems and Improvements.

Based on the evaluation results, three major problems affected the effectiveness of the waste management program. First, coordination among the facilitating team, RW administrators, and waste collection workers was uneven, and in several RWs, program implementation depended heavily on a small number of active individuals. Such dependence could affect program continuity when key individuals were unavailable or no longer actively involved. Second, the capacity of local organic waste treatment facilities remained insufficient to consistently reduce the amount of residual waste generated across the study area. Third, only 42.19% of households practiced waste sorting, indicating that source separation had not yet become routine for the majority of households. Consequently, the quality and consistency of separated waste entering the collection and treatment system remained variable. These findings demonstrated that the challenges faced by the program were not exclusively technical but also involved coordination, governance, infrastructure capacity, and the sustainability of community participation [16, 22]. The main problems identified and the corresponding recommendations are summarized in Table 4. Although the overall waste reduction rate reached approximately 50.04% and exceeded the national target of 30%, residual waste still accounted for 49.96% of total waste generation. Furthermore, only 10.93% of the total waste generated was treated organically within the area, while 24.80% depended on treatment through DLH. These results indicated that achieving the numerical reduction target alone did not necessarily demonstrate a fully effective or resilient waste management system. Greater attention was required to improve source separation, expand decentralized organic treatment, and reduce the quantity of waste remaining in the residual stream.

Table 4. Problems and recommendations for improving the waste management program.

Problem	Condition	Implication	Recommendation
Household sorting rate	42.19% of households sorted waste	Source separation was not yet practiced by the majority of households	Conduct repeated education and household-level monitoring
Total waste reduction	46,440.82 kg/month (50.04%)	The 30% national reduction target was exceeded	Maintain reduction performance while focusing on further residue reduction
Residual waste	46,374.11 kg/month (49.96%)	The burden on TPS/TPA remained substantial	Improve source separation and organic waste treatment
Organic waste treated within the area	10,142.00 kg/month (10.93%)	Local treatment capacity remained limited, while 24.80% depended on DLH	Expand decentralized organic treatment facilities near the source
Differences among RWs	RW 12: 82%; RW 6: 34%	Waste reduction performance remained uneven	Prioritize interventions in high-generation and low-performing RWs

As indicated in Table 4, improving the program required more than general awareness campaigns. Household education needed to be conducted repeatedly and supported by monitoring, feedback, and stronger involvement of collection workers. Previous evidence on household waste separation showed that information alone was generally insufficient to establish sustained behavioral change; continuous reinforcement, supervision, and appropriate incentive mechanisms were also important [4,17]. Waste bank operations also required standardized monthly recordkeeping to improve the traceability of recovered materials and allow their contribution to waste reduction to be evaluated consistently. In addition, stronger integration between community-based waste management activities and municipal waste management policies could improve the continuity and credibility of material recovery systems [11].

Increasing local organic waste treatment capacity represented another important priority. Because organic waste contributed 35.73% of total waste reduction, expanding treatment closer to the source could substantially strengthen the program. The existing system treated only 10.93% of total waste generation within the area, demonstrating considerable dependence on external treatment. Additional decentralized treatment facilities could reduce transportation requirements, improve local treatment autonomy, and decrease the amount of organic material entering the residual stream. Importantly, increased treatment capacity needed to be accompanied by improved household sorting so that organic waste reaching these facilities had sufficient quality for effective processing.

Finally, interventions needed to be prioritized according to the waste burden and performance of individual RWs rather than distributed uniformly across the entire subdistrict. For example, RW 6 represented an important priority because it had a relatively large population and waste generation burden but achieved only a 34% reduction rate. By contrast, higher-performing RWs could provide operational lessons that might be adapted for lower-performing areas. A targeted approach would allow limited financial, infrastructure, and human resources to be directed toward areas where improvements could produce the greatest reduction in residual waste. Such prioritization was particularly relevant for resource-constrained municipal waste management systems, where targeted interventions could improve the efficiency of resource allocation [2].

3.6. Limitations and Future Research.

This evaluation had three main limitations. First, the analysis relied primarily on secondary records. Waste-stream masses were obtained from field records, while total waste generation was estimated using a generation coefficient of 0.27 kg/person/day rather than measured directly using the eight-day sampling procedure specified in the national standard [14]. Consequently, the estimated waste generation and reduction rates may not have fully reflected actual daily variations in household waste generation. Second, the quantitative analysis covered only a single month, June 2025. Therefore, seasonal variations in waste generation and composition, particularly organic waste generation, as well as changes in household participation over time, were not captured. A longer monitoring period would have provided a more representative assessment of program performance and allowed temporal changes in sorting and waste reduction to be evaluated. Third, waste bank records were incomplete, which may have resulted in an underestimation of recyclable inorganic waste recovery. Therefore, the reported inorganic recovery rate of 14.31% should be interpreted as a lower-bound estimate rather than the complete amount of recyclable material recovered from the study area. Future research should include continuous monitoring for at least one year and apply direct sampling to determine actual waste generation and composition. The evaluation should also be extended to other subdistricts, including areas with and without assisted waste management programs, to assess the external validity and transferability of the findings. In addition, future studies should incorporate an economic assessment covering collection labor costs, treatment facility investment, operational and maintenance costs, and avoided transportation and disposal costs. Integrating technical, environmental, social, and economic indicators would provide a more comprehensive basis for determining whether the Cihaurgeulis waste management approach could be sustainably replicated in other urban communities.

4. Conclusions

Based on the evaluation results, the waste reduction program in Cihaurgeulis Subdistrict showed relatively good performance during June 2025. Total waste generation was estimated at 92,814.93 kg/month, equivalent to 0.27 kg/person/day, of which 46,440.82 kg/month was reduced through organic waste treatment and inorganic waste recovery. This represented an overall waste reduction rate of approximately 50.04%, which exceeded the national reduction target of 30% for 2025. At the RW level, all RWs individually exceeded the national target, with reduction rates ranging from 34% to 82%. Nevertheless, the overall effectiveness of the program remained limited by several important challenges. The household sorting rate reached only 42.19%, while residual waste still accounted for 49.96% of total waste generation. In addition, organic waste treated within the area represented only 10.93% of total generation, whereas 24.80% depended on city-scale treatment. Institutional coordination among RWs also required further strengthening. Without the contribution of city-scale organic waste treatment, the autonomous waste reduction rate would have decreased to approximately 25%, which was below the national target. Therefore, limited decentralized organic waste treatment capacity represented a critical gap in the resilience of the existing system. Based on these findings, improvement efforts should prioritize RWs with high waste generation and relatively low reduction performance, strengthen repeated household education accompanied by regular monitoring, standardize waste bank recordkeeping, and expand decentralized organic waste treatment capacity. Overall, the program achieved substantial waste reduction during the evaluation period; however, its long-term sustainability depended on maintaining consistent source separation and ensuring that separated waste was effectively directed to appropriate recovery and treatment pathways.

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Author Contributions

Laila Syifa Sefia: Conceptualization, methodology, data collection, data curation, formal analysis, visualization, and writing—original draft. Iwan Juwana: Conceptualization, methodology, supervision, validation, and writing—review and editing. All authors have read and approved the final version of the manuscript.

Competing Interest

The authors declare that they have no known financial, personal, or professional competing interests that could have influenced the work reported in this article.

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